UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

LIST OF PUBLICATIONS AND PATENTS[1]
of the
Northern Utilization Research Branch
Peoria, Illinois

January - June 1954

PUBLICATIONS

[Publications marked (*) are not available for distribution]

SOYBEANS.
J. C. Cowan.
Pages 689-701 of "Encyclopedia of Chemical Technology," Vol. 12.
Interscience Encyclopedia, Inc., New York, N. Y., 1954.

This is a brief article for the Encyclopedia of Chemical Technology on important aspects of soybeans, with emphasis on chemistry, processing, and utilization.

BAKING BEHAVIOR AND OXIDATION REQUIREMENTS OF SOY FLOUR. I. COMMERCIAL FULL-FAT SOY FLOURS.
C. W. Ofelt, A. K. Smith, and Robert E. Derges.
Cereal Chem. 31(1): 15-22. January 1954.

A baking survey was made of the commercial production of full-fat soy flours over a 6-month period. Bromate responses and tolerances of the soy flours, added at a 5-percent level, are shown. The effects of each flour, when added at a 5-percent level to a basic wheat flour, on the baking behavior of the basic flour were compared with effects of addition of 4 percent nonfat dry milk solids. Each formula was adjusted for optimum conditions of oxidation, absorption, and mixing time.

BAKING BEHAVIOR AND OXIDATION REQUIREMENTS OF SOY FLOUR. II. COMMERCIAL DEFATTED SOY FLOURS.
C. W. Ofelt, Allan K. Smith, and James M. Mills.
Cereal Chem. 31(1): 23-28. January 1954.

A baking survey was made of the commercial production of defatted soy flour over a 5-month period. Bromate responses and tolerances of the

---

[1] Previous lists of Northern Utilization Research Branch's publications and patents were issued as NM-305, AIC-187, AIC-187 Supplements 1-6, AIC-318, and AIC-318 Supplements 1-5.

soy flours, added at a 5-percent level, are shown. The effects of each flour, when added at a 5-percent level to a basic wheat flour, on the baking behavior of the basic flour were compared with effects of addition of 4 percent nonfat dry milk solids. Each formula was adjusted for optimum conditions of oxidation, absorption, and mixing time.

METAL INACTIVATION IN EDIBLE OILS BY CARBOXYMETHYLMERCAPTO SUCCINIC ACID.
C. D. Evans, A. W. Schwab, and Patricia M. Cooney.
Jour. Amer. Oil Chem. Soc. 31(1): 9-12. January 1954.

The coordinating efficiency of carboxymethylmercapto succinic acid for trace metals has led to an investigation of its use in edible oils and shortenings. Effects of concentration, place of addition, and processing factors are discussed and results shown for a variety of products. Oxidative and organoleptic results are reported showing the stabilizing effect in presence and absence of added metals. These effects are compared with those achieved with other metal inactivators.

A NOTE ON STARCH OF HIGH AMYLOSE CONTENT FROM CORN WITH HIGH STARCH CONTENT.
W. L. Deatherage, M. M. MacMasters, M. L. Vineyard, and Robert P. Bear.
Cereal Chem. 31(1): 50-52. January 1954.

A series of strains of corn with a new endosperm type has been produced, in which the amylose content of the starch varies with the genetic composition of the corn. The strains have a nondeficient type of endosperm, which in some members of the series contains starch of 55 to over 60 percent amylose content. One strain was found to contain 60 percent starch, and 14.3 percent protein, the starch having a 56-percent amylose content. Recovery of the starch by a laboratory wet-milling method was about the same as is usually obtained in processing ordinary corn by the same method. The high-amylose starches of the series of strains are composed of birefringent, irregularly shaped granules somewhat smaller than those in ordinary field corn. The granules are only partially gelatinized in boiling water.

SYNTHESIS OF THIODISUCCINIC ACID.
A. W. Schwab.
Jour. Amer. Chem. Soc. 76(2): 623-624. January 20, 1954.

Interest in use of thiodisuccinic acid as a possible chelating agent has stimulated its preparation. The compound is pentadentate and the sulfur atom can function as a coordinating atom in the formation of chelate rings, especially with the heavy metal ions.

PRINCIPLES AND TECHNIQUES OF CHROMATOGRAPHY.
R. J. Dimler
Transactions (American Association of Cereal Chemists) 12(1): 1-28.
February 1954.

A review is given of principles and techniques involved in three types of chromatography--partition, adsorption, and ion exchange.

Chromatography is defined as an operation involving differential migration of the components of a mixture through a polyphase system. Using an analogy of extraction in a separatory funnel, the types of chromatography are compared and discussed. A description is given of the process of paper partition chromatography and of some factors such as molecular structure and solvent composition which influence results. Some features of adsorption chromatography are reviewed with emphasis on the effect of the adsorption isotherm on distribution of a compound in a developed band. The similarity of ion-exchange chromatography to an adsorption process is pointed out and applications of ion-exchange methods indicated. Emphasis is placed on the fact that practice still is far ahead of theory in chromatography. Experience therefore is important in application of these techniques and interpretation of results.

PRODUCTION OF CLINICAL-TYPE DEXTRAN. PARTIAL HYDROLYTIC DEPOLYMERIZATION AND FRACTIONATION OF THE DEXTRAN FROM LEUCONOSTOC MESENTEROIDES STRAIN NRRL B-512.

Ivan A. Wolff, C. L. Mehltretter, R. L. Mellies, P. R. Watson, B. T. Hofreiter, P. L. Patrick, and C. E. Rist.
Indus. and Engin. Chem. 46(2): 370-377. February 1954.

Present military specifications for clinical-type dextran require a product with a weight-average molecular weight of 75,000 ± 25,000, determined by the light-scattering method, and having a relatively narrow molecular weight distribution within specified limits. In this manuscript, detailed laboratory procedures are set forth for preparation of such material in yields of up to 43-47 percent by partial hydrolysis of high-molecular-weight, native NRRL B-512 dextran with hydrochloric or sulfuric acid, followed by fractional precipitation of the desired portion of the hydrolyzate with methanol or ethanol. Kinetics of the hydrolysis and the effect of different variables in the hydrolysis and fractionation steps on amount and properties of clinical-type dextran produced are discussed.

POLYSACCHARIDE ARYL CARBAMATES. IV. PARTLY SUBSTITUTED AND CROSS-LINKED STARCH CARBAMATES.

Ivan A. Wolff, Paul R. Watson, and Carl E. Rist.
Jour. Amer. Chem. Soc. 76(3): 757-759. February 5, 1954.

Preparation of partially substituted starch carbamates, both in anhydrous pyridine and in aqueous medium, is described. Gelatinization-resistant starches result when as little as one hexamethylene-dicarbamyl cross link for each 500 anhydroglucose units is introduced. Many starch carbamates still show the cross under polarized light, and are microscopically indistinguishable from untreated cornstarch.

LACTAM OF N-(β-AMINOETHYL)-CHELIDAMIC ACID--A PYRIDOPIPERAZINE RING.
A. W. Schwab.
Jour. Amer. Chem. Soc. 76(4): 1189-1190. February 20, 1954.

In an attempted synthesis of 1,1'-ethylene-bis-/2,6-dicarboxy-4-pyridone/, a new salt of chelidonic acid has been discovered. When treated with dilute hydrochloric acid, the ethylenediamine salt of chelidonic acid yields a new cyclic lactam. The reduced form of this lactam is a heterocyclic ring system which has not been previously reported.

AGRICULTURAL RESOURCES. /EAST NORTH CENTRAL STATES/
P. Burke Jacobs and R. T. Milner.
Indus. and Engin. Chem. 46(3): 472-477. March 1954.
(Mimeographed copies of the article are available under the title "Agricultural Resources of the East North-Central States for the Chemical Industry.")

A statistical survey of agricultural production in the East North-Central States (as a part of a Symposium for the American Chemical Society) in which the potentiality of the area for the chemical and related industries is estimated. Since processing of agricultural products at a given geographical location is not necessarily limited to crops produced in such locality, the relationship of each crop in the area to the total U. S. production is shown.

THE CHEMICAL COMPOSITION OF SOME LEAF AND BAST FIBERS.
E. C. Lathrop and G. H. Nelson.
TAPPI 37(3): 99-103. March 1954.

Proximate chemical analyses are presented for 15 of the more common leaf and bast fibers. These fibers are uniformly low in lignin and high in cellulose contents. Leaf fibers are higher in pentosan content than bast fibers, but lower than cereal straws and bagasse. Since leaf and bast fibers could contribute high-tearing strength to specialty papers made from them, some small-scale preliminary pulping experiments are reported. Chemical requirements for pulping seem to be lower and pulp yields higher than indicated in the older literature.

COUNTERCURRENT FRACTIONATION OF LIPIDS.
Herbert J. Dutton.
Pages 292-325 of book entitled "Progress in the Chemistry of Fats and Other Lipids," Vol. 2, edited by R. T. Holman, W. O. Lundberg, and T. Malkin, Pergamon Press Ltd., London, England, March 1954.

A review of published literature dealing with liquid-liquid extraction of fats and other lipids.

POTASSIUM ACID SACCHARATE BY NITRIC ACID OXIDATION OF DEXTROSE.
G. C. Mustakas, R. L. Slotter, and R. L. Zipf.
Indus. and Engin. Chem. 46(3): 427-434. March 1954.

Pilot-plant experiments to provide engineering data on production of potassium acid saccharate are described, as well as factors affecting yield and purity of the salt. Results of the experiments indicate that potassium acid saccharate with a purity of 98 to 99 percent may be produced industrially by this process at a total production cost of 32.7 cents per pound.

A SIMPLE TECHNIQUE FOR OBTAINING MATING TYPES IN HETEROTHALLIC DIPLOID YEASTS, WITH SPECIAL REFERENCE TO THEIR USES IN THE GENUS HANSENULA.
Lynferd J. Wickerham and Kermit A. Burton.
Jour. Bact. 67(3): 303-308. March 1954.

A procedure has been devised for obtaining mating types from a sporulated culture by killing the vegetative cells with heat and culturing the live ascospores. Cells from resulting colonies are mixed, and those mixtures which form sexual spores consist of opposite mating types. Sexes of different species are mixed to determine whether two species will hybridize. Diploid hybrids may be recognized by the large size of their colonies. Haploid hybrids may be obtained by isolating and cultivating ascospores of diploid hybrids.

PRACTICAL EXPERIENCES WITH ALCOHOL-WATER INJECTION IN TRUCKS AND FARM TRACTORS.
Richard Wiebe and John D. Hummell.
Agr. Engin. 35(5): 319-326. May 1954.

Adaptability of alcohol-water injection in truck and farm tractor operation and its compatibility with premium-type lubricating oils have been studied. In a truck test it was found that, with injection, a gasoline of 10 octane numbers lower than that needed for knock-free operation can be used and that combination of straight-run gasoline with injection resulted in cleaner engines. Use of a number of high-compression tractors increased power and economy by 10 to 20 percent over that obtainable in standard tractors. Increase in power and smoothness of operation were of more importance to the farmer than saving in fuel. Lubricating oil tests showed that bearing weight losses and final acidity were significantly less when injection was used.

SEPARATIONS OF SOY BEAN INOSITIDE FRACTIONS OF LOW PARTITION COEFFICIENT.
C. R. Scholfield and H. J. Dutton.
Jour. Biol. Chem. 208(1): 461-469. May 1954.

Through use of a lead-salt-precipitation procedure, phosphatidyl ethanolamine and an inositol-containing phosphatidic acid have been isolated from an alcohol-insoluble portion of soybean "lecithin."

VITAMIN B_{12} BY FERMENTATION WITH STREPTOMYCES OLIVACEUS.
V. F. Pfeifer, C. Vojnovich, and E. N. Heger.
Indus. and Engin. Chem. 46(5): 843-849. May 1954.

This investigation was undertaken to determine suitable operating conditions for the industrial production and recovery of vitamin B_{12} produced by fermentation of a satisfactory substrate with Streptomyces olivaceus, NRRL B-1125. Yields of vitamin B_{12} formed were usually in the range of 1.2 to 1.6 mg. per liter when suitable medium constituents and operating conditions were employed. Vitamin B_{12} concentrates with potencies in the range of 10 to 20 mg. per pound were prepared by evaporation and drum or spray drying. Losses of vitamin during recovery processes amounted to between 5 and 30 percent of the vitamin present in the fermented liquor. Cost estimates indicate that vitamin B_{12} concentrates may be produced by this process at a total cost of 2.7 cents per mg. of vitamin.

WHAT CAUSES GRAIN TO SPOIL?
Majel M. MacMasters.
Grain pp. 4, 6, 8. May 1954.
Grain and Feed Jours. Consolidated 111(10): 31-33. May 26, 1954.

Existing information on the structure and storage of cereal grains is reviewed. The structure of the grain is a major factor to be considered in drying, and also explains the common presence of molds within the kernels. Grain at a moisture content above that in equilibrium with air at 74 percent relative humidity is liable to mold and heat in storage. Improper artificial drying may lower the value of the grain both for feeding and for industrial use; "safe" drying conditions depend upon the kind of grain and the purpose for which it is to be used.

PRESSURE-VOLUME-TEMPERATURE RELATIONSHIPS OF ALCOHOL VAPORS.
Carl B. Kretschmer and Richard Wiebe.
Jour. Amer. Chem. Soc. 76(9): 2579-2583. May 5, 1954.

Vapor densities of methyl, ethyl, and isopropyl alcohols have been measured at 40° to 120° C. and at pressures up to 760 mm. or half the saturation pressure, whichever is smaller. The uncertainty of the measurements was of the order of 3 parts in 10^5 in $(pV)/(RT)$ at 760 mm., and was greater at lower pressures, being approximately inversely proportional to pressure. The equation $V = RT/p + B + Dp^2$, used by Weltner and Pitzer, and Barrow, was found to fit experimental results and to give satisfactory agreement with vapor heat capacities measured by these authors and by DeVries and coworkers, and also gave satisfactory agreement with saturated vapor densities calculated from heats of vaporization measured by Fiock, Ginnings, and Holton.

THE SECTION GENEVENSIS OF THE GENUS MUCOR.
C. W. Hesseltine.
Mycologia XLVI(3): 358-366. May-June 1954.

Importance of the mold genus Mucor is well known in connection with various fermentations, for example, the steroid oxidation, and in contamination and spoilage of stored grains and food. Since no modern or English treatment of the genus Mucor exists, this paper is the first of a proposed series dealing with identification of its members. This paper describes the major sections of the genus with keys to their identification and a detailed treatment of the species of one of these sections. A new species is described along with a key and description of the other forms in the section Genevensis.

PILOT-PLANT PRODUCTION OF CLINICAL-SIZED DEXTRAN BY ACID HYDROLYSIS OF THE ENZYMATICALLY SYNTHESIZED HIGH POLYMER.
V. E. Sohns, S. P. Rogovin, H. F. Conway, and C. T. Langford.
U. S. Dept. Agri. AIC-372, 30 pp. (Processed.) June 1954.

A process has been developed on a pilot-plant scale whereby clinical-sized dextran is produced by a combined enzymatic and hydrolytic procedure. This method results in a simplified and less expensive process for the commercial production of dextran. From results of calculations based on a plant with a capacity of 30,000 kilograms of dry clinical-sized dextran annually, it appears that production cost of the material can be reduced at least 50 percent when compared to the cost by the whole-culture method.

THE PRODUCTION OF THE NEOMYCIN COMPLEX BY STREPTOMYCES ALBOGRISEOLUS, NOV. SP.
R. G. Benedict, O. L. Shotwell, T. G. Pridham, L. A. Lindenfelser, and W. C. Haynes.
Antibiotics and Chemotherapy 4(6): 653-656. June 1954.

An actinomycete, culture 7-A, was isolated which showed appreciable antibacterial activity against a variety of gram-positive and gram-negative bacteria. Subsequent studies suggested that this organism was not identical with any previously described species of the genus Streptomyces and a new species name; S. albogriseolus, NRRL B-1305 was assigned to it.

The antibiotic complex was identified as that of neomycin by chemical studies and comparative Craig countercurrent distributions of a purified sample from B-1305 with that of neomycin sample No. J-279 from Commercial Solvents Corporation.

SOURCES OF COLOR IN SOYBEAN "LECITHIN."
C. R. Scholfield and Herbert J. Dutton.
Jour. Amer. Oil Chem. Soc. 31(6): 258-261. June 1954.

Carotenoids, brown pigments, and occasionally porphyrins give color to soybean "lecithin." Hydrogen peroxide bleaching destroys all color bodies to some extent, but by far the greater effect is on the carotenoids. The brown color is probably an aldehyde-amine reaction product. It is increased by use of high temperatures during processing of the oil or "lecithin."

** ADD TO AIC-318, Supplement 5

PROGRAM ON CORN USE.
R. T. Milner.
Proceedings of Eighth Annual Hybrid Corn Industry-Research Conference; published by American Seed Trade Association, 30 North LaSalle Street, Chicago 2, Illinois. Publication No. 8, pp. 20-30. December 2-3, 1953.

A discussion of the present situation concerning corn and future possibilities for its use, including disposition of corn, present chief uses of corn sold off the farm, relative amounts of wet- and dry-milled products, and present over-all use-pattern of corn. Both the physical and chemical studies carried out on corn by the Northern laboratory are indicated.

CONTRACT RESEARCH PUBLICATIONS

(Report of research work done by outside agency under contract with the U. S. Department of Agriculture and supervised by the Northern Utilization Research Branch of the Agricultural Research Service.)

STALING STUDIES OF BREAD MADE WITH FLOUR FRACTIONS.
W. G. Bechtel and D. F. Meisner. American Institute of Baking, Chicago, Illinois.

I. FRACTIONATION OF FLOUR AND PREPARATION OF BREAD.
Cer. Chem. 31(3): 163-170. May 1954.

II. SELECTION OF THE SENSORY TEST PANEL.
Cer. Chem. 31(3): 171-175. May 1954.

III. EFFECT OF CRUMB MOISTURE AND OF TAILINGS STARCH.
Cer. Chem. 31(3): 176-181. May 1954.

IV. EFFECT OF GLUTEN AND WHEAT STARCH.
Cer. Chem. 31(3): 182-187. May 1954.

** Notice of publication received after preparation of list for last period.

/These patents are assigned to the Secretary of Agriculture.
Copies of patents may be purchased from the
U. S. Patent Office, Washington, D.C./

METHOD OF MAKING NONSWELLING STARCH GRANULES WITH DIISOCYANATES.
Ivan A. Wolff and Paul R. Watson.
U. S. Patent 2,668,169. February 2, 1954.

Starch is converted chemically to produce derivatives of varying degrees of inertness to further chemical or physical change, particularly to swelling in water. The conversion products are useful as inert carriers for insecticides and as dusting powders for rubber articles.

PROTEIN ADHESIVES.
Arthur C. Beckel and Paul A. Belter.
U. S. Patent 2,668,766. February 9, 1954.

Adhesive compositions are described comprising the alcohol-extracted proteinaceous soybean residue. Alcohol-extracted proteinaceous soybean residue is extracted with water to separate in aqueous solution a component which may be used as a re-moistening or heat sealing adhesive. The water extract may be spray dried to obtain the adhesive in dry, finely divided form.

POLYMERIZATION PROCESS USING HYDROGEN FLUORIDE.
Clarence Bradford Croston, Howard M. Teeter, and John C. Cowan.
U. S. Patent 2,670,361. February 23, 1954.

Long chain fatty acids, their esters, or mixtures are polymerized by heating with hydrogen fluoride.

PREPARATION AND USE OF POLYSACCHARIDE-PRODUCING ENZYME.
Harold J. Koepsell, Anna Kazenko, Allene R. Jeanes, Eugene S. Sharpe, and Carl A. Wilham.
U. S. Patent 2,673,828. March 30, 1954.

Dextran is produced by first obtaining a dextran-synthesizing enzyme secreted by microorganisms, such as Leuconostoc mesenteroides, and then subjecting aqueous solutions of sucrose to the separated enzyme.

PRODUCTION OF ORGANIC ACIDS.
Andrew J. Moyer.
U. S. Patent 2,674,561. April 6, 1954.

Low-molecular-weight alcohols or methyl acetate is added to a mold fermentation in the production of organic acids, such as citric, itaconic, and ethylene oxide dicarboxylic acid. Important increases in yield result.

DEODORIZATION PROCESS.
Robert E. Beal and Earl B. Lancaster.
U. S. Patent 2,674,609. April 6, 1954.

Edible glyceride oils, particularly soybean oil, are rendered more stable against oxidative deterioration by a continuous, low pressure deodorization. The refined, degummed and bleached oil is deodorized, usually with the aid of a stripping agent at 20-60 microns pressure and at 190° to 250° C.

INJECTOR FOR INJECTING AUXILIARY LIQUID TO THE FUEL OF INTERNAL-COMBUSTION ENGINES.
James C. Porter and William B. Roth.
U. S. Patent 2,675,788. April 20, 1954.

Invention covers an alcohol (other auxiliary liquid) injection device for admixing coolants with gasoline or other internal combustion engine fuel. The device is designed so that coolant is injected into the fuel only at times when needed. It makes possible more efficient fuel consumption. The injection device is actuated by changes in the intake manifold pressure and is entirely automatic in its operation.

SUBSTITUTED GLUCONAMIDES.
Charles L. Mehltretter, Russell L. Mellies, and John C. Rankin.
U. S. Patent 2,670,345. February 23, 1954.

A chemical derived from glucose, D-gluconolactone, is reacted with a primary amine, and the resulting product sulfated to give a new class of wetting agents.

STARCH SACCHARIFYING ENZYMES HIGH IN MALTASE ACTIVITY.
Julian Corman, Henry M. Tsuchiya, and Harold J. Koepsell.
U. S. Patent 2,676,905. April 27, 1954.

A fungal enzyme composition high in starch-splitting potency is prepared from certain molds by employing a culture medium free of calcium carbonate.

HYDROGENATION DERIVATIVES OF DIFURFURALACETONE.
Kliem Alexander and Lester E. Schniepp.
U. S. Patent 2,676,972. April 27, 1954.

A series of hydroxylated derivatives, useful as intermediates in organic chemistry, are produced by hydrogenating difurfuralacetone to various degrees. Difurfuralacetone and a hydrogenation catalyst are treated under pressure with gaseous hydrogen to give, depending on the degree of hydrogenation, 2-(β-furylethyl)-1,6-dioxaspiro-[4.4] nonane, 2-(β-tetrahydrofurylethyl)-1,6-dioxaspiro-[4.4] nonane, 1-tetrahydrofuryl-3,6,9 nonanetriol and 1,4,7,10,13-tridecanepentaol.